TRADE CREDIT FINANCING IN AFRICAN AGRO-FOOD MANUFACTURING INDUSTRY: INCIDENCE AND MOTIVES

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Abstract
Trade credit is a form of short-term financing employed by non-financial firms in inter-firm trade. This study examines the incidence and the motives for extending trade credit among agro-food manufacturing firms in Africa. The study uses a subsample of agro-food firms from 2014 World Bank Enterprise Survey data from eight African countries: Burundi, Malawi, Mauritania, Namibia, Nigeria, Senegal, Sudan and South Sudan. The incidence of trade credit is relatively high among agro-food firms as 60.5% and 55% of firms extend and receive trade credit respectively. However, the mean proportion of yearly total input purchases received as trade credit (22%) is higher than the mean proportion of yearly total sales extended as trade credit (19%). From the two-limit Tobit estimation, firm size, manager experience, degree of product diversification, access to bank credit, overdraft availability and supplier credit are found to play a significant role in the level of trade credit firms extend to customers. However, when supplier credit is added to the model, it completely absorbs the effect of access to bank credit. For suspected endogeneity of supplier credit, an instrumental variable (IV) two-limit Tobit is estimated and the results show no presence of endogeneity. From the results, transaction, quality verification, marketing and long-term relationship motives for extending trade credit to customers are implied.

Keywords: Trade Credit, Trade Credit Theories, Agro-Food Firms, Two-Limit Tobit, Africa

JEL Classifications: L66, L14

1. Introduction

Trade credit is an important component of inter-firm trade globally. Studies in North America, Europe, Africa, Asia and other parts of the world have shown trade credit to be significant component of short-term assets and liabilities of firms. The magnitude of trade credit is reflected by accounts receivable and accounts payable in the balance sheet of firms. Trade credit is equated to accounts receivable when a firm sell goods to customers on credit and is equated to accounts payable when a firm buy inputs from suppliers on credit. A less common form of trade credit is prepayment or advanced payment, where payment precedes the delivery of goods (Cuevas et al., 1993). Unlike credit from traditional financial intermediaries, trade credit is a restricted type of financing as credit is tied to the sale (purchase) of goods (Emery, 1984). The importance of trade credit in inter-firm trade has drawn research attention for the past decades. Until recently, the literature was largely theoretical, focussing on providing explanation for the existence of trade credit and why firms give and/or accept trade credit (e.g. Schwartz, 1974; Ferris, 1981; Emery, 1984; Nadiri, 1969). The recent literature is empirical in nature, testing existing theories of trade credit with different samples of firms and in different countries. Many of the theories; financing, transaction, marketing/sales promotion, price discrimination, long-

term relationship and quality guarantee theory, have received some level of empirical support generally.

A general conclusion arising from many studies is that trade credit activity, credit terms and magnitude vary by country, industry and the characteristics of goods involved in exchanges (see Miwa and Ramseyer, 2005; Seifert et al., 2013; Cuevas et al., 1993; Ng et al., 1999; García-Teruel and Martínez-Solano, 2010). Yet, research focusing on trade credit activity in particular industries is rare. Most studies are conducted on firms across broad industries and then control for particular industries in their econometric models. By this approach, these studies provide relevant information broadly yet deficient to the extent that they provide limited understanding of trade credit activity in particular industries. For the agro-food industry in particular, many studies have concluded it is a low trade credit activity area and that cash sales dominate trading activity as opposed to credit sales. The arguments are founded in the nature of market structure of agro-food industries and the characteristics of agro-food products. Long et al (1993) noted that agricultural goods markets are highly competitive and hence goods have always been sold on cash rather than on credit basis. Food products are typically perishable and turnover is fast, as such less credit may be offered in the industry (Schwartz, 1974; Ferris, 1981; Emery, 1984; Cuevas et al., 1993). Where trade credit is involved, the credit terms are shorter because of the perishable nature of agro-food products and the fast turnover time (Long et al., 1993; Cuevas et al., 1993; Fafchamps et al., 1995).The perishable nature of food products means less time is required for verification (to observe quality) before payment (Long et al., 1993).

From the foregoing, it is unclear the extent of involvement of agro-food firms in trade credit relationships and their motives behind the extension of trade credit.Yet very few studies (e.g. Gustafson, 2004; Kihanga et al., 2010; Alarcón, 2008; Cuevas et al., 1993) have focused on agro-food firms to provide understanding of trade credit activity in the agro-food industry. The few existing studies have shown that trade credit is an important short-term finance employed by firms albeit the focus have been on small and medium agro-food firms. Cuevas et al (1993) found 67% of food firms offer trade credit in Ghana, Alarcón (2008) found trade credit extended to constitute 29% of total firm assets among Spanish agro-food firms and Kihanga et al (2010) found rice traders sell 67% of their goods on credit in Tanzania. Concerning African agro-food manufacturing firms, the empirical question is: what is the incidence of trade credit activity and what are the motives driving the extension of trade credit? This study addresses this question using a sample of agro-food manufacturing firms from eight African countries-Burundi, Malawi, Mauritania, Nigeria, Namibia, Senegal, South Sudan and Sudan. The main objective is to identify the motives for extension of trade credit by agro-food firms in Africa through the factors that influence the extension of trade credit.

Agro-food manufacturing firms occupy an important place in the manufacturing landscape of African countries. From a policy perspective, knowledge on the financial operations of these firms may lead to improvement in the industry. This is particularly important as financial markets in Africa are still largely underdeveloped and firms tend to face significant financial barriers (Seifert et al., 2013). This study is related to previous studies that have used World Bank enterprise survey data to examine trade credit activity at the firm level (e.g. Cuevas et al., 1993; Isaksson, 2002, Fafchamps et al., 1995) yet different in many respects. Firstly, previous studies examined trade credit activity among firms in broad industrial areas and did not focus

particularly on agro-food firms and thus did not address the question raised in this study. Secondly, the methodological approach is different from previous studies. For instance, important factors such degree of product diversification, international diversification and manager experience which rarely feature in previous studies in Africa and elsewhere are captured in this study. Also the concern of possible endogeneity of trade credit received and trade credit supplied largely ignored in previous studies is dealt with in this study.

2. Theories and Hypothesis Development

The overall objective for firms engaging in trade credit activity is the maximization of firm value in the short-run and/or long-run. The decision to engage in trade credit activity is an economic decision, based on comparison of discounted costs and discounted benefits (Schwartz, 1974; Ferris, 1981). However, there are specific motives that propel firms into extending trade credit customers downstream. The various theories of trade credit are constructed around these motives. Regarding the extension of trade credit, this study examines four theories of trade credit: financing theory, marketing /sales promotion theory, long-term relationship theory and quality verification theory.[1] Marketing motive is especially believed to be deriving the extension of trade credit by agro-food firms given that the agro-food industry is a competitive industry (e.g. Cuevas et al., 1993). These theories are interrelated and are not mutually exclusive; they are discussed briefly. The financing theory opines that the very existence of trade credit in business relationships is due to imperfections in financial markets (Schwartz, 1974; Emery, 1984). If financial markets were perfect, the incentive for non-financial firms to engage in supplying credit will be nil and financial intermediation will be left solely to traditional financial intermediaries. From the standpoint of agro-food firm as supplier of trade credit, the financing theory dictates agro-food firms that have financial resources will use the resources to fund the purchases of its customers and according to Emery (1984), it is a way of generating excess rate of return on liquid reserves. Hill et al (2012) argue that the potential for earning interest income is a motivation for supplying trade credit. Funding purchases of customers is especially important if the customers are credit rationed in financial markets. Drawing on Schwartz (1974) version of financing theory, an agro-food firm with easier and cheaper access to credit from financial markets may borrow from financial markets and in turn use the money to extend trade credit to its customers who may be rationed from financial markets or have liquidity problems generally. Therefore, in a trade credit supply equation, bank credit as predictor variable is expected to carry a positive sign.

Marketing (or sales promotion) theory states that the motivation for extension of trade credit is to increase sales (Nadiri, 1969; Wilner, 2000; Bremann et al., 1988). It is of limited relevance when it comes to explaining the demand for trade credit from suppliers upstream. Firms will sell on credit if doing so will yield a positive expected return. Nadiri (1969) was the first to propound the marketing or sales promotion theory of trade credit. Following the argument of Nadiri (1969), agro-food firms can use trade credit to expand the existing market for their goods and the cost of doing so should be treated like advertising expense. This theory is very applicable to firms operating in the agro-food industry as it is a matured industry characterized by high competition. As argued in the literature (e.g. Pike and Cheng, 2003; Fisman and Raturi, 2004), the supply of trade credit will be high in competitive markets. In a competitive industry, young

[1] There are other theories of trade credit such as transaction cost theory, tax theory and price discrimination theory, albeit the data employed only support the examination of these theories.

and small firms can use trade credit to gain market share (Long et al., 1993). In some industries and jurisdictions, selling goods on credit is a standard business practice and for firms to be competitive, they must adhere to the industry standards.

A closely related theory to marketing theory is long-term relationship theory (or customer-retention theory). Offering trade credit is a way of building long-term relationship with customers, which is expected to yield returns over time (Nadiri, 1969; Wilner, 2000; Wilson and Summers, 2002; Long et al., 1993). Especially in a competitive industry like the agro-food industry, offering trade credit may prevent customers from switching to different suppliers (see Van Horen, 2005; Alarcón, 2008). This reflects the argument in certain quarters that buyers with market power may prevail upon their suppliers to extend trade credit. Even agro-food firms which are credit constrained or in distress may still extend trade credit as a way of retaining their customers and increasing sales (Brennan et al., 1998; Van Horen, 2005; Fabbri and Klapper, 2008). The quality guarantee or verification theory of trade credit (Smith, 1987; Long et al., 1993) stipulate that firms offer trade credit to allow their customers time to verify the quality of the products before making payment. Trade credit can promote sales by serving as product quality guarantee or as signal for product quality to stimulate demand (Long et al., 1993; Smith, 1987). In the presence of information asymmetry, offering trade credit may enable firms to try products before making payment especially for products that are new to customers. The fact that an agro-food firm is offering trade credit signal that the products are quality since low-quality suppliers are less likely to sell on credit. This theory is relevant in the context where the firm in question is new, a product offered or a market is new to an existing product.

Following from the theories present above, the general model for this study is of the form:

$$DTC = f(FM, MM, LM, QM) \qquad (1)$$

Where DTC=trade credit extended, FM=financing motive, MM= marketing motive, LM=long-term relationship motive and QM is quality verification motive. The model shows extension of trade credit by agro-food firms is explained by financing, marketing, long-term relationship and quality verification motives. However, these motives are not directly observable; they are inferred from factors relating to firm demographic characteristics (FC), financial characteristics (FIC) and operational characteristics (OC) that affect the extension of trade credit to customers downstream. Equation (1) is thus rewritten as:

$$DTC = f(\mathrm{FC}, \mathrm{FIC}, \mathrm{OC}) \qquad (2)$$

The level of trade credit extended (DTC) is determined jointly by the characteristics of the FIRM and that of the customer. That is, a firm willingness and ability to extend trade credit coupled with what the customer willingness and ability to make payment at maturity (Petersen and Rajan, 1997). However, information on the customer is unavailable in this study; the only information available is that of the firm. Therefore DTC is explained only by factors relating to the firm. As a result, the parameter estimates of equation (2) will be reduced-form estimates that may carry both supply and demand effects (ibid). The results should be interpreted in within the context of relationships (Petersen and Rajan, 1997; Giannetti et al., 2011).

Next literature is reviewed on the firm, financial and operational factors (equation 2) that proxy for financing, marketing, long-term relationship and quality verification motives for extending trade credit and the ensuing hypotheses. These include firm age, firm size, foreign ownership, product diversification, international diversification, access to bank credit, availability of overdraft facilities, financial constraint, competition and capacity utilization

Firm age has been widely used in trade credit models to imply the financing theory of trade credit (e.g. Petersen and Rajan, 1997; Alarcón, 2008; Kihanga et al., 2010). Age conveys information on the reputation, credit quality and riskiness of a firm. Older firms should have better access to credit from both traditional financial intermediaries and supplier firms due to their perceived low riskiness, high credit quality and high reputation resulting from their long existence (Alarcón, 2008; García-Teruel and Martínez-Solano, 2010; Petersen and Rajan, 1997; Fisman and Raturi, 2004; Isaksson, 2002). Older firms generally have existed long enough to develop reputation and build relationships with other firms and financial institutions that can enable them access credit. They can also leverage on their reputation and credit quality capital to access financial resources and use same to finance the purchases of their customers. In this case, older firms will extend more trade credit. Conversely, it has also been argued that younger firms may offer more trade credit as a way of building reputation and entering into markets (Long et al., 1993). In this regard, younger firms extending trade credit may be pursuing a marketing/sales promotion motive and this behavior will be explained by marketing rather financing theory. Thus depending on the direction of the effect of age on trade credit extended, the marketing theory of trade credit can also be implied. The empirical literature has shown little consensus on the relationship between firm age and trade credit extension to customers. Petersen and Rajan (1997) found older firms to extend more trade credit, Kihanga et al (2010) and Li (2011) found younger firms to extend more trade credit and García-Teruel and Martínez-Solano (2010) found mixed results in their study in seven European countries. Age is used in this study to test the marketing and long-relationship motive for trade credit extension.

Hypothesis 1: Young agro-food firms will extend more trade credit compared to older firms that have established market niches.

With respect to firm size, generally large firms will have the financial resources to extend credit to their customers compared to small firms. Large firms can use their position to borrow from traditional financial intermediaries and in turn use the money to finance their customers who may lack access to financial markets in line with the financing theory of trade credit (García-Teruel and Martínez-Solano, 2010). Large firms may also seek to establish and maintain market power by using trade credit as a tool (Isaksson, 2002). This connotes the marketing motive of extending trade credit. A positive relationship between firm size and extension of trade credit have been supported in a number of studies (e.g. Petersen and Rajan, 1997; García-Teruel & Martínez-Solano, 2010; Gustafson, 2004; Vaidya, 2011). Conversely, other studies have found small firms to extend more trade credit to customers than large firms and thus a negative relationship between firm size and extension of trade credit (Li, 2011; Long et al., 1993; Alarcón, 2008; Fabbri and Klapper, 2008). García-Teruel and Martínez-Solano (2010) argue that large firms may have established reputation in the market and may not require the use of trade credit to pursue their marketing agenda. From the empirical results, the effect of firm size on trade credit

extension is not clear. In this study, firm size is used to imply marketing and long-term relationship theories of trade credit.

Hypothesis 2: Small firms will extend more trade credit to customers as a marketing or relationship building strategy.

Access to short-term external finance may play a role in trade credit extension. Short-term external financing can take the form of bank credit and overdraft facilities. Bank credit includes credit lines, credit cards and short term loans. These are generally short term financing facilities as they are used to finance operating expenditure as opposed to long term investments. From the supply side of trade credit, firms with access to bank credit may borrow and use the funds to finance the purchases of their customers who may be facing credit rationing in financial markets. Inherent in this behavior is the quest of supplier firms to keep their customers in business and to maximize their sales. Helping customers facing distress through the supply of trade credit is a way of building long-term business relationships, thus creating/preserving market for a firm's products. Firms can gain a positive financial return on bank credit extended as trade credit provided the interest cost of bank credit is lower than interest charges on trade credit extended. Therefore, besides financing motives, marketing and long-term relationship motives can be implied from the relationship between access to external credit and trade credit extended to customers. A number of studies have found positive relationship between access to external credit and extension of trade credit (Long et al., 1993; Petersen and Rajan, 1997; Bougheas et al., 2009; Carvalho and Schiozer, 2015; García-Teruel and Martínez-Solano, 2010; Alarcón, 2008) while others found no relationship (Gustafson, 2004; Li, 2011). Besides external credit from banks, firms that receive supplier credit will be more likely to extend trade credit. The arguments are similar to access to external finance.

Hypothesis 3: Agro-food firms with access to bank credit will extend more trade credit.

Hypothesis 4: Agro-food firms with access to overdraft facilities will extend more trade credit.

Hypothesis 5: Agro-food firms with access to supplier credit will extend more trade credit.

Financing constraint may affect the capacity of agro-food firms to supply credit to their customers. Financing constraint may emanate from lack of internal funds as well as limited access to external financing sources. Firms may face financing constraint due to credit rationing in financial markets (Petersen and Rajan, 1997). On the supply side, firms facing financing constraint will less likely extend trade credit to their customers. However, Burkart and Ellingsen (2004) state that in a competitive industry, some financial constrained firms may offer credit to promote sales while others may avoid extending trade credit. Hence depending on the sign of financing constraint coefficient, financing and marketing motives can be implied.

Hypothesis 6: Agro-food firms facing financing constraint will supply less trade credit to their customers.

Product diversification may be directly related to extension of trade credit but has rarely been explored in the trade credit literature. Product diversification is where firms add new products to their main product (Aaker, 1980). Diversification may also take the form of acquisition of other

firms that produce new products (Li and Greenwood, 2004). The production of diversified products imply the firm may be competing in different market segments and offering trade credit may help gain market share in the respective market segments. Especially for relatively new products added by a firm to its existing product line or as a new product line altogether, the firm may use trade credit as a marketing or sales promotion mechanism to introduce the product into the market. Wholesalers and retailers may have less incentive to carry new products much less making cash payment for new products because of uncertainty of how the products will perform in the market. Because new products may be unfamiliar to consumers, trade credit may enable wholesale and retail firms to try new products with their customers without making outright payment.

Hypothesis 7: Product diversified firms will extend more trade credit

The diversification into international markets through direct exports or indirectly through market intermediaries may have influence on the extension of trade credit. Participation in foreign markets may increase the level of trade credit granted by supplier firms (Chandler, 2009) and the key motivation is marketing and quality guarantee. Trade credit may be a marketing vehicle for firms to enter into international markets controlled by incumbent firms and gain market share. Trade credit may especially be important as new goods may be unfamiliar to buyers in international markets and thus buyers may need time to verify the quality and quantity of goods before making payment. Offering goods on credit will therefore incentivize wholesale/retail firms to carry the goods. Very few studies (e.g. Chandler, 2009; Fabbri and Klapper, 2008; Albuquerque et al., 2015; Van Horen, 2005) have paid attention to international diversification and extension of trade credit. Chandler (2009) found that the level of trade credit extended increase with diversification into international markets among small and medium firms (SMEs) in Canada, Van Horen (2005) found exporting firms to extend more trade credit to customers in developing countries while Fabbri and Klapper (2008) found no relationship in their study of Chinese firms.

Hypothesis 8: The level of trade credit extended to customers will increase with international diversification.

A firm's competitive position in the market can be enhanced by extending trade credit. Fabbri and Klapper (2008) states that extension of trade credit can be a competitive mechanism with the effect of reducing actual competition or creating entry barriers. For this reason, firms without access to credit may still extend credit to their customers (ibid). They found that firms facing higher competition are more likely to offer trade credit. Van Horen (2005) argues that in monopoly situations (or less competitive markets generally), the propensity to provide trade credit is very low as customers have no (limited) option(s) in the market. Also firms dealing with customers with market power are likely to provide trade credit in order to retain their business. Trade credit can be used to lock in customers, thus creating a stable customer base for the firm in question (Fisman and Raturi, 2004; Cheng and Pike, 2003). In sum, the effect of competition on trade credit extension can be situated in the marketing and long-term relationship theoretic argument for trade credit extension.

Hypothesis 9: Firms facing higher level of competition in their product market will extend more trade credit.

Capacity utilization may indicate the demand situation for a firm's product (Isaksson, 2002). A firm with higher capacity utilization may mean the firm is producing and selling more and extension of trade credit may be a factor driving high sales and hence higher capacity utilization. Another perspective is that firms experiencing low capacity utilization may use trade credit to increase demand for their products. Hence the effect of capacity utilization on the extension of trade credit is unclear.

Hypothesis 10: Firms with high capacity utilization will extend more trade credit.

Manager experience has rarely been examined in relation to extension of trade credit. Chandler (2009) examined manager experience but on trade credit received. However, a firm manager's years of working experience in the same or related industry may have effect on trade credit extension decisions of the firm. However, the effect may not clear. On one hand, experienced managers may restrict the extension of trade credit if their experience with extending trade credit in the past has been negative. On the other hand, experienced managers may encourage the extension of trade credit if their past experience has shown trade credit facilitate the sale of goods. In this study, positive relationship between manager experience and trade credit extension is expected.

Hypothesis 11: Agro-food firms with experienced managers will extend more trade credit to customers for purposes of increasing sales.

Table 1: Summary of Variables, Applicable Theories and Hypothesis

Variable	Applicable Theories	Expected Sign
Age	Marketing/long-term relationship	+
Firm size	Marketing/long-term relationship	-
Access to bank credit	Financing/marketing	+
Overdraft facilities	Financing/marketing	+
Financing constraint	Financing	-
Product diversification	Marketing/quality verification	+
International diversification	Marketing/quality verification	+
Competition	Marketing/long-term relationship	+
Capacity utilization	Marketing	+
Manager experience	Marketing	+
Supplier Credit	Financing/marketing	+

3. Data Description

The data used are from 2014 World Bank enterprise survey of manufacturing firms in eight African countries-Burundi, Malawi, Mauritania, Nigeria, Senegal, Namibia, South Sudan and Sudan. The firms included in the survey are those with formal registration status in manufacturing and service sectors operating in cities of major economic activity. The enterprise survey includes small, medium and large scale enterprises defined by size of workforce. To ensure representativeness of sample, the sampling procedure employed is stratified random

sampling, with stratification based on firm size, business sector and geographical location. The respondents to the survey are owners and top managers of firms and independent (non-governmental) organizations are contracted by the World Bank to administer the survey in each country. The methodology and survey questionnaire are standardized to enable comparability of data and findings across countries (World Bank, 2009). The data come in unstandardized format (country datasets) and standardized format where data from various countries are combined.[2] This study used the standardized dataset, which follows a global methodology.[3]

The 2014 enterprise survey data are used as they are the latest survey that has covered a number of African countries and are suitable for the purposes of this study. The data extraction and preparation is done in a sequential manner. Data that were not collected in 2014 are first dropped. Secondly, data collected in 2014 from countries outside Africa are dropped, leaving data from the eight African countries aforementioned. Since the interest is on agro-food manufacturing firms, a combination of International Standard Industrial Classification Code (ISIC) for food manufacturing firms (ISIC 15) and ISIC codes for sub-food manufacturing industries (1511-1551) are used to select food firms included in the study. To remove outliers, four food firms identified as micro –firms are dropped. The final sample of agro-food firms came to 551 firms and is distributed across meat, dairy, beverage, fat and oil, sugar and confectionary, bakery, grain mills, fruits and vegetables and miscellaneous food sub-industries. Finally, the relevant variables are extracted since the survey covered wide range of subjects and not necessarily centered on trade credit. For the variables selected, 'I don't know' responses (coded -9) and 'refuse to answers' responses (coded -7) are set to missing. Incorporating 'I don't know' or 'refuse to answer' responses in the analysis is problematic since the questions are not likert scale questions. An examination of the data does not show any systematic pattern of missingness and thus should not bias the results of the study. Therefore, due to the presence of missing data, the results of the descriptive and econometric analysis contain varying sample sizes. The summary statistics of the variables used are presented in Table 5.

4. Variables and Measurement

The dependent variable, level of trade credit extended (DTC), is defined as the ratio of accounts receivable to total sales of a firm. This measure indicates the amount of trade credit supplied by agro-food firm i in year t as a proportion of its total sales for the same time period. For the independent variables, level of trade credit received or supplier credit (UTC), is defined as the ratio of accounts payable to total input purchases. This measure indicates the amount of trade credit received by agro-food firm i in year t as a proportion of its total input purchases for the same time period. Firm age is measured as natural logarithm of years of firm existence plus one. Firm size is measured as the natural logarithm of the number of full time employees plus 0.5 part-time employees following previous studies using similar World Bank Survey data (e.g. Fisman and Raturi, 2004). This measure gives the total employment of a firm. Top manager experience is captured by the natural logarithm of years of experience working in the same or closely related industry. In this study, product diversification is defined as the proportion of sales represented by the firm's main product. This variable takes values from 100 (undiversified-produces a single product) to any value less than zero. Higher values depict lower degree of product diversification and vice versa. International diversification is participation of firms in

[2] The unstandardized datasets contain country specific information not found in the standardized dataset.
[3] More details on the methodology employed can be found at http://www.enterprisesurveys.org/methodology

foreign markets (selling goods beyond the boundaries of the country the firm is situated). The variable is constructed by combining the proportion of total sales exported directly and indirectly through other intermediaries. It assumes values from 100 (meaning all goods produced are exported) to 0 (meaning all goods produced are sold locally). Thus, higher values represent higher degree of international diversification and vice versa.

Foreign ownership is measured as binary; 1 if at least 10% of firm is foreign owned and 0 otherwise. Access to bank credit is measured as binary; 1 if a firm has access to line of credit from a financial institution and 0 otherwise. Availability of overdraft facility from financial institution is measured with three binary variables; overdraft1 =1 if overdraft facilities are available to the firm and 0 otherwise, overfdraft2=1 if overdraft facilities are not available and 0 otherwise and overdraft3=1 if a firm does not know if overdraft facilities are available and 0 otherwise.[4] Financial constraint is measured as binary; 1 if a firm indicates no or minor finance obstacle and 0 otherwise. Competition captures the level of competition firms' face in their major market of operation for their main product. The number of competitors indicated by firms is used to construct the following categories: 1= firm does not know the number of competitors, 2= firm face minimal competition (0-2 competitors), 3= firm face low competition (3-50 competitors), 4=firm face average competition (51-100 competitors) and 5= firm face high competition (greater than 100 or uncountable competitors). [5] Capacity utilization is utilized capacity of a firm over its total capacity. Four binary variables are created from this variable as follows: IDK Capacity =1 if a firm does not know the capacity in use and 0 otherwise, Low Capacity = 1 if a firm's capacity utilization range from 1-49% and 0 otherwise, Medium Capacity=1 if a firm's capacity utilization range from 50-79% and 0 otherwise, and High Capacity=1 if a firm's capacity utilization range from 70-100% and 0 otherwise. Sub-industry dummies, capital city location dummy and country dummies are included to capture industry and location effects. The variables and measurement are summarized in Appendix1.

5. Method of Analysis-Econometric Model

The dependent variable, level of trade credit extended is represented by y_i for convenience in this section. The y_i assume values from 0 to 100; 0 means all sales are made on cash basis (no trade credit) and 100 means all sales are made on credit terms. Thus 0 is the lower limit (L_{1i}) and 100 is the upper limit (L_{2i}) and in between the limits are array of values. Because y_i is censored at both the lower and upper limit, the application of conventional ordinary least squares (OLS) method will lead to biased and inconsistent estimates (Amemiya, 1973; Long, 1997; Greene, 2002; Maddala, 1983). For observations where $y_i = 0$, OLS will tend to underestimate the intercept and overestimate the slope of the regression line. Similarly, OLS will tend to overestimate the intercept and underestimate the slope of the regression if only observations where $y_i > 0$ are utilized (Fernando, 2011). To obtain consistent estimates for a model with censored dependent variable, an appropriate model to employ is Tobit model, named after James Tobin (1958) who first proposed the model. Specifically, the two-limit Tobit (also called double-censored Tobit) is found appropriate in this study as y_i is bounded on the left and right or censored from above and below (Amemiya, 1973; Greene, 2002; Jöreskog, 2002; Maddala, 1983).

[4] This categorization was instigated by the fact that many firms indicated they do not know. It is possible that overdraft may be available but firms simply are not in the known.
[5] Some firms stated the number of competitors were uncountable.

Assuming there is a latent variable, y_i^* (unobserved level of trade credit extended) underlying the distribution of y_i which can take values less than 0 or greater than 100 in addition to the 0-100 values (Burkey and Harris, 2003); following Maddala (1983), the two-limit Tobit is of the form:

$$y_i^* = \boldsymbol{\beta}'\boldsymbol{x}_i + \boldsymbol{\mu}_i \quad (3)$$

$$y_i = L_{1i} \ if \ y_i^* \leq L_{1i} \quad (4)$$
$$y_i = y_i^* \ \ if \ L_{1i} < y_i^* < L_{2i} \quad (5)$$
$$y_i = L_{2i} \ if \ y_i^* \geq L_{2i} \quad (6)$$

i=1, 2, 3… n.

From this specification, $\boldsymbol{x}_i$ is a row vector $(1 \times k)$ of predictor variables, $\boldsymbol{\beta}$ is a column vector $(k \times 1)$ of unknown parameters corresponding to $\boldsymbol{x}_i$ to be estimated and $\boldsymbol{\mu}_i$ is a stochastic error term assumed to have a normal distribution, thus $\boldsymbol{\mu}_i \overset{iid}{\sim} (0, \sigma^2)$. All other terms are as defined earlier. The likelihood function for the two-limit Tobit is of the form:

$$L(\beta, \sigma | y_i, \boldsymbol{x}_i, L_{1i}, L_{2i}) = \sum_{y_i = L_{1i}} \Phi\left(\frac{L_{1i} - \boldsymbol{\beta}'\boldsymbol{x}_i}{\sigma}\right) \sum_{y_i = y_i^*} \frac{1}{\sigma} \emptyset\left(\frac{y_i - \boldsymbol{\beta}'\boldsymbol{x}_i}{\sigma}\right) \sum_{y_i = L_{2i}} \left[1 - \Phi\left(\frac{L_{2i} - \boldsymbol{\beta}'\boldsymbol{x}_i}{\sigma}\right)\right] \quad (7)$$

Where $\Phi(.)$ is cumulative distribution function (cdf) which relates to the censored observations, $\emptyset(.)$ is probability density function (pdf) and relates to the non-censored observations and σ is the standard deviation. The likelihood function expressed above thus has a mixture of continuous and discrete distributions (Greene, 2002). The parameters, $\boldsymbol{\beta}$ and σ, are estimated via maximum likelihood (ML) by maximizing equation (5) with respect to $\boldsymbol{\beta}$ and σ. The method of maximum likelihood produces estimates that are consistent (Maddala, 1983; Jöreskog, 2002; Greene, 2002). The estimated coefficients ($\boldsymbol{\beta}$) are the marginal effects of change in $\boldsymbol{x}_i$ on y_i^*, the unobserved level of trade credit extended. However, the interest is in the marginal effects of change in $\boldsymbol{x}_i$ on y_i, the observable level of trade credit extended. The effect of change in $\boldsymbol{x}_i$ on y_i is through the effect of $\boldsymbol{x}_i$ on y_i^*, and thus $\boldsymbol{\beta}$ is important in the computation. In this regard, Maddala (1983) derived the conditional expectation that y_i falls in the interval between the lower limit (L_{1i}) and upper limit (L_{2i}). From equation (7), denoting $\Phi[(L_{1i} - \boldsymbol{\beta}'\boldsymbol{x}_i) / \sigma]$as Φ_{1i} and $\Phi[(L_{2i} - \boldsymbol{\beta}'\boldsymbol{x}_i) / \sigma]$ as Φ_{2i}, the $E(y_i)$ is as follows:

$$E(y_i | L_{1i} < y_i^* < L_{2i}) = \boldsymbol{\beta}'\boldsymbol{x}_i + E(\mu_i | L_{1i} - \boldsymbol{\beta}'\boldsymbol{x}_i < \mu_i < L_{2i} - \boldsymbol{\beta}'\boldsymbol{x}_i)$$
$$= \boldsymbol{\beta}'\boldsymbol{x}_i + \sigma \frac{\Phi_{1i} - \Phi_{2i}}{\Phi_{2i} - \Phi_{1i}} \quad (8)$$

The marginal effect of change in $\boldsymbol{x}_i$ on y_i is given by:

$$\partial E(y_i) / \partial(\boldsymbol{x}_i) = \boldsymbol{\beta} E(y_i | L_{1i} < y_i^* < L_{2i}) \quad (9)$$

The empirical two-limit Tobit model specified for the determinants of level of trade credit extended is as follows:

$$DTC_i = \beta_{0i} + \beta_{1i}logFirmAge + \beta_{2i}logFirmSize + \beta_{3i}ManagerExperience + \beta_{4i}ForeignOwnership + \beta_{5i}productDiversification + \beta_{6i}InternationalDiversification + \beta_{7i}Credit + \beta_{8i}Overdraft1 + \beta_{9i}Overdraft2 + \beta_{10i}FinancialConstraint + \beta_{11i}Competition + \beta_{12i}LowCapacity + \beta_{13i}MediumCapacity + \beta_{14i}HighCapacity + \beta_{15i}SupplierCredit + \beta_{16i}Capital + \upsilon_i + \nu_i + \varepsilon \quad (10)$$

In the specification, β_0 is the intercept term, $\beta_1 - \beta_{16}$ are parameters relating to the predictor variables to be estimated, υ_i is sub-industry fixed effects, ν_i is country fixed effects and ε_i is error term. Also i=1, 2, 3…n and represents agro-food firms, the unit of analysis. All other variables have been defined in the variables and measurement section (4). Overdraft3 and IDK Capacity are excluded in the model to avoid dummy variable trap; they are used as reference categories for the remaining variables relation to overdraft availability and capacity utilization respectively.

5. Results and Discussion

5.1. Incidence and Level Trade Credit

The incidence of trade credit activity among agro-food firms is reported in Table 2. About 60.5% of firms extend trade credit to customers and 55% of firms receive trade credit from suppliers. This pattern is observed across all firm sizes-small, medium and large firms. Also, when firms are segregated into sub-industries, beverage, fat and oil, bakery, grain, and miscellaneous food firms are more into extending trade credit than receiving trade credit. In general, the results show that many agro-food firms extend trade credit than they receive trade credit, suggesting trade credit may be driven by commercial motives.

Table 2: Incidence of Trade Credit among Agro-Food Firms

Category	All	Small	Medium	Large	Meat	Diary	Bev	FatOil	Sugar	Bakery	Grain	Fruit	Misce
DTC	287	142	105	40	18	5	52	11	7	130	18	2	44
	(60.5)	(61.5)	(58.3)	(63.5)	(39.1)	(38.5)	(74.3)	(57.9)	(50)	(66.0)	(69.2)	(18.2)	(56.4)
N	474	231	180	63	46	13	70	19	14	197	26	11	78
UTC	256	113	111	35	21	7	35	10	7	114	16	6	43
	(55.0)	(50.7)	(61.7)	(55.6)	(44.7)	(53.8)	(53.0)	(52.6)	(53.8)	(59.1)	(61.5)	(50.0)	(55.8)
N	466	223	180	63	47	13	66	19	13	193	26	12	77

Figures in parentheses are percentages and Bev, FatOil, Sugar, Bakery, Grain, Fruit, Misce represent beverage, fat and oil, Sugar and confectionery, bakery, grain mills, fruit and vegetables, and miscellaneous food firms respectively.

The trade credit status of agro-food firms in terms of their involvement or otherwise in trade credit relationship with suppliers, customers, or both is examined. From Table 3, agro-food firms assume one of four mutually exclusive statuses: no trade credit activity (no TC), trade credit activity with only suppliers (UTC only), trade credit activity with only customers (DTC only),

and trade credit activity with both suppliers and customers (both UTC and DTC).[6] More agro-food firms (45%) are in the category of extending and receiving trade credit. Firms that do not sell goods nor purchase inputs on credit (trade on purely cash basis) are relatively many, about 30% of the sample. Similar pattern is observed when firms are segregated into small, medium and large firms, and also by sub-industry except meat, diary, and fruit and vegetables sub-industries.

Table 3: Trade Credit Status of Agro-Food Firms

Category	All	Small	Medium	Large	Meat	Diary	Bev	FatOil	Sugar	Bakery	Grain	Fruit	Mis
No TC	138	69	49	20	19	6	13	8	6	52	6	5	23
	(30.2)	(31.1)	(27.8)	(33.9)	(42.2)	(46.1)	(19.7)	(42.1)	(46.2)	(27.5)	(24.0)	(45.5)	(30.3)
UTC only	46	18	25	3	8	2	5	-	1	14	2	4	10
	(10.0)	(8.1)	(14.2)	(5.0)	(17.8)	(15.4)	(7.6)		(7.6)	(7.4)	(8.0)	(36.4)	(13.1)
DTC only	67	40	19	8	7	-	18	1	-	27	3	-	11
	(14.7)	(18.0)	(10.8)	(13.6)	(15.6)		(27.3)	(5.3)		(14.3)	(12.0)		(14.5)
Both UTC	206	95	83	28	11	5	30	10	6	96	14	2	32
and DTC	(45.1)	(42.8)	(47.2)	(47.5)	(24.4)	(38.5)	(45.4)	(52.6)	(46.2)	(50.8)	(56.0)	(18.1)	(42.1)
N	457	222	176	59	45	13	66	19	13	189	25	11	76
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

Figures in parenthesis are percentages. All other variables are as defined earlier.

The preceding analysis considered only the incidence of trade credit activity and trade credit status of agro-food firms. This following analysis concerns the proportion of total yearly sales and input purchases extended and received as trade credit respectively (Table 4). On average, the proportion of firms' total input purchases on account (22%) is higher than the proportion of their sales of goods on account (19%). In contrast, Alarcón (2008) studied publicly listed food firms in Spain and found firms extend high level of trade credit than they receive with a difference of about 8%. Many studies have found accounts receivables to exceed accounts payable among firms (e.g. García-Teruel and Martínez-Solano, 2010; Ferrando and Mulier, 2011). Firm size appear directly related to the level of trade credit extended. Large, medium and small firms extend 24%, 19% and 17.5% respectively of their total sales as trade credit. Similar pattern is observed when it comes to proportion of total input purchases on trade credit terms. Relative to firms in other sub-industries, firms operating in grain mill, bakery and meat sub-industries extend higher level of trade credit. Firms in these sub-industries also receive higher level of trade credit from suppliers. The average level of trade credit extended and received across firms and sub-industries is relatively low owing largely to large number of firms granting and receiving zero amount of trade credit. This lend support to the general believe that cash sales dominate trade in the agro-food industry because of the perishable nature of food products and fast turnover time.

[6] To create these mutually exclusive categories, only firms that responded to both questions on trade credit extended and trade credit received are included in this part of the analysis. Firms that responded to either question are excluded but they are included in all other analysis.

Table 4: Level of Trade Credit Extended and Received

Category		Mean	Robust S.E	Min	Max	N
Level of Trade Credit Extended (DTC)	All	19.00	1.13	0	100	474
	Small	17.50	1.50	0	100	231
	Medium	19.04	1.83	0	100	180
	Large	23.93	3.76	0	100	63
	Meat	21.20	4.85	0	100	46
	Diary	13.10	6.20	0	80	13
	Beverage	19.10	2.46	0	100	70
	Fats and Oil	10.00	2.91	0	50	19
	Sugar and Confectionary	16.79	7.69	0	90	14
	Bakery	20.10	1.70	0	100	197
	Grain	27.81	5.32	0	95	26
	Fruits and vegetables	8.66	5.97	0	65	11
	Miscellaneous foods	16.64	2.67	0	80	78
Level of Trade Credit Received (UTC)	All	22.00	1.29	0	100	466
	Small	18.72	1.73	0	100	223
	Medium	23.30	1.94	0	100	180
	Large	29.70	4.60	0	100	63
	Meat	25.21	5.10	0	100	47
	Diary	20.38	7.59	0	100	13
	Beverage	16.23	2.78	0	90	66
	Fats and Oil	15.80	4.22	0	60	19
	Sugar and Confectionary	18.50	5.32	0	60	13
	Bakery	23.54	2.04	0	100	193
	Grain	29.04	6.78	0	100	26
	Fruits and vegetables	16.25	4.97	0	40	12
	Miscellaneous foods	21.78	3.01	0	90	66

The standard errors are heteroscedastic consistent standard errors

5.2. Descriptive Summary of Independent Variables

The summary statistics of the variables used in the econometric models are presented in Table 5.[7] The average agro-food firm in the sample is relatively experienced with 17 years in operation. The average agro-food firm has 101 employees (full time employees +.5 part-time employees), albeit the large firms in the sample have swelled up the average firm size. Ten and half percent (10.5%) of the average agro-food firm is owned by foreigners, indicating many of the firms are locally owned. The average top manager of an agro-food firm has 15 years food or closely related industry experience. The level of product diversification is 87%. By interpretation, the main product of the average agro-food firm account for 87% of total sales. Many of the firms in the sample are thus less diversified in their products (smaller values means higher product diversification). The average agro-food firm has 15% of total sales from exporting directly and

[7] The log of age and age squared, log of firm size, log of years of top manager experience are used in the actual econometric models. However, this study finds the descriptive statistics of the actual values more informative. Also access to overdraft facilities, days of input inventory kept and capacity utilization as presented here have each being recoded into categories and used in the econometric models.

indirectly to foreign markets. The firms sell more domestically than they export and are thus less diversified internationally.

The proportion of firms with access to bank credit is low (19%). This is not surprising as financial markets in Africa and developing countries generally are underdeveloped and many firms, especially small firms tend to suffer from credit rationing. Also 35% of firms indicated they have overdraft facilities available from banks and 43% indicated finance is a constraint to business operation. Competition is measured as scale variable (1-5) and the mean value of 3.5 suggests firms face average to high competition in their major markets of operation per the categorization employed (see variables and measurement section). In terms of input inventories, the average number of days of input inventories kept by firms is 14 days with minimum of 0 and maximum of 360 days. For those that keep inventories for a year, it may suggest that the supply of their raw materials is seasonal such as in most parts of Africa where agricultural production is rainfed and seasonal. On average, agro-food firms in the sample use around 75% of their production capacity. This is very high operational capacity and extension of trade credit may enhance capacity utilization through high sales. Finally, 41% of firms are located in capital cities; such firms may likely have more access to external financial resources as well as bigger markets. Presented on Table 6 is the correlation matrix of independent variables used in the econometric models. An inspection of the correlation coefficients shows a very low level of correlation among the variables. The low correlations among the independent variables suggest multicollinearity should be of less concern.

Table 5: Descriptive Summary of Independent Variables

Category	Mean	Robust S.E	Min	Max	N
Age	17.22	.61	1	121	519
Firm Size (Employment)	101.14	17.96	5	5000	543
Manager Experience	14.70	.45	1	72	529
Foreign Ownership	10.50	1.14	0	100	529
Product Diversification	87.37	.84	8	100	534
International Diversification	15.41	1.42	0	100	509
Access to Credit	.19	.02	0	1	525
Overdraft Availability	.35	.03	0	1	343
Financial Constraint	.43	.02	0	1	544
Competition	3.50	.07	1	5	551
Capacity Utilization	75.34	1.23	1	100	374
Supplier Credit	22.00	1.29	0	0	466
Capital City	.41	.02	0	1	551

Table 6: Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.UTC	1															
2.LAge	0.10	1														
3.LSize	0.23	0.31	1													
3.LMX	0.12	0.45	0.10	1												
4.Fgn	-0.10	-0.27	0.18	-0.20	1											
5.PD	-0.05	0.06	-0.22	0.08	-0.32	1										
6.ID	0.06	0.09	0.28	0.02	0.14	-0.24	1									
7.Credit	0.23	0.07	0.31	0.08	0.01	-0.07	0.14	1								
8.Ovdft1	0.25	0.03	0.30	0.10	0.13	-0.16	0.13	0.35	1							
9.Ovdft2	-0.06	-0.14	-0.24	0.02	-0.02	0.11	-0.10	-0.18	-0.48	1						
10.Finan	-0.11	0.08	0.12	-0.11	0.02	-0.10	0.14	-0.08	-0.09	-0.13	1					
11.Com	-0.06	-0.15	-0.21	-0.09	-0.12	0.09	-0.24	-0.12	-0.11	0.10	-0.09	1				
12.LCap	-0.01	-0.02	0.04	0.01	0.11	-0.24	0.26	0.07	0.06	-0.04	-0.06	0.06	1			
13.MCa	0.04	-0.05	0.02	-0.10	0.11	-0.07	0.09	0.10	0.07	-0.04	-0.07	0.06	-0.14	1		
14.HCap	0.09	-0.04	0.04	0.01	-0.13	0.14	-0.20	0.02	0.03	0.07	-0.01	0.22	-0.33	-.40	1	
15.Capit	0.174	-0.11	0.11	-0.05	0.29	-0.21	-0.06	0.13	0.21	0.01	-0.16	0.01	0.03	.08	-.07	1

UTC=supplier credit, LAge is logFirmAge, LSize=log of Firm Size, LMX=log Manager Experience, Fgn=Foreign Ownership, PD=product diversification, ID=international diversification, Credit=access to credit, Ovdft1=overdraft1, Ovdft2=overdraft2, Finan=financial constraint, Com=competition, LCap=low capacity, MCa=medium capacity, HCap=high capacity and Capit=Capital.

5.3. Determinants of Trade Credit Extension

Table 7 presents the results of OLS, probit and two-limit Tobit estimations. The OLS (model1) and probit (model2) results are for comparative purposes; the main results are the two-limit Tobit results (model 3 and 4). All the models are statistically at the one percent level. The reported parameter estimates are marginal effects at the mean.

In model 3, when supplier credit is excluded, firm size, manager experience, degree of product diversification, access to credit, overdraft availability and high capacity utilization are significantly related to the extension of trade credit. Firm size is significant and positive against the prediction in hypothesis 2. Large firms extend higher amount of trade credit. Aside the fact that they may have the resources to extend trade credit, they may also seek to maintain market power by extending more trade credit. Top manager experience in the industry is directly related to the level of trade credit extended to customers, suggesting manager experience is important when it come to trade credit supply decisions. Product diversification is negatively and significantly associated with extension of trade credit at the five percent level of significance. As smaller values depicts higher level of product diversification, the negative marginal effect suggest firms producing more diversified products supply higher level of trade credit than their less product diversified counterparts. This finding provides support to the marketing/sales promotion and quality guarantee theory of trade credit. A firm supplying diversified products suggests competing in different market segments and offering trade credit may increase competitiveness. New products that are added to a firm's product portfolio may not be familiar to customers and thus customers may need time to test products for quality before making payment. To be competitive, firms with new products may use trade credit as quality guarantee to their customers.

Access to bank credit is positively and significantly related to the level of extension of trade credit. This suggests that firms with improved access to bank credit may borrow from banks in

order to finance the purchases of their customers downstream as stipulated in the financing theory of trade credit. This finding is consistent with the finding of Alarcón (2008) in Spain where bank credit significantly influences trade credit extension among agro-food firms. Furthermore, firms with overdraft facilities from banks will extend more trade credit to customers relative to firms without knowledge of availability of overdraft facilities. This provides further support to the importance of liquidity of a firm in trade credit supply decisions. Firm may leverage on their liquidity position to extend trade credit to customers to stimulate demand for their goods. Also the results show firms that do not have overdraft facilities available still extend more trade credit relative to firms that are unaware of overdraft availability.

Firms operating in beverage, grain mills and bakery sub-food industries extend more trade credit to customers relative to firms in fruit and vegetables sub-food industry (reference category). This finding is not surprising as fruit and vegetables have short shelf live and are highly perishable relative to other products; cash sales will characterized transactions in such markets as oppose to credit sales as explained in the literature (e.g. Emery, 1984; Schwartz, 1974). Also, the competitiveness of beverage, grain mills and bakery products markets may be high relative to fruit and vegetable markets, and as stated by Fabbri and Klapper (2008) and Van Horen (2005), trade credit may be used by firms in competitive markets to enhance their competitive positioning. Firms located in the capitals of the countries studied extend more trade credit. Locating in the capital city may enhance a firm's access to financial resources that can be used to drive sales through supply of trade credit to customers. Also, the capitals of many African countries tend to be the business hubs, characterized by high competitiveness; extending trade credit may promote sales in such environments.

When supplier credit is introduced into the analysis (model4), the effect of access to credit is completely absorbed though the marginal effect remains positive. Also firm size becomes insignificant in model 4 with the addition of supplier credit. Beside access to credit and firm size, all other variables that are significant in model 3 are significant in model 4. The signs of the marginal effects remain the same. The level of receipt of supplier credit is significantly associated with the level of extension of trade credit to customers at the one percent level. From the results, supplier credit is more important in explaining the level of trade credit extended than access to credit or overdraft availability.

Table 7: Determinants of Trade Credit Supplied

	OLS		Probit		Two-Limit Tobit			
	Model 1		Model2		Model3		Model4	
Trade Credit Extended	Coef.	Robust S.E	dy/dx	Robust S.E	dy/dx	Robust S.E	dy/dx	Robust S.E
LogFirmAge	-.0440*	.02	.0010	.16	-.0440	.04	-.0467	.04
LogFirmSize	.0203	.01	.0060	.03	.0435**	.02	.0234	.02
LogExperience	.0413**	.02	.1464	.05	.0607*	.03	.0566*	.03
Foreign Ownership	-.0540	.04	.0633	.08	-.0622	.06	-.0625	.06
Product Diversification	-.1530**	.07	-.3852**	.16	-.2550**	.11	-.2492***	.09
Int. Diversification	-.0058	.40	-.4000	.11	.0172	.06	-.0076	.06
Access to Credit	.0276	.03	.1270*	.07	.0860*	.05	.0613	.05
Overdraft Availability1	.0979**	.04	.1824*	.10	.1970***	.07	.1607**	.07
Overdraft Availability2	.0458*	.03	.1176	.08	.0946**	.05	.0791*	.04
Financing Constraint	.0362	.03	.3890	.06	.0275	.04	.0528	.04
Supplier Credit	.3067***	.06	.5628***	.13			.4670***	.08
Competition	.0075	.01	.0320	.02	.0065	.01	.0155	.01
Low Capacity	.0028	.05	-.1486	.11	-.0109	.08	-.0251	.07
Medium Capacity	-.0115	.04	-.0444	.10	.0273	.06	-.0236	.06
High Capacity	-.0397	.03	-.1360*	.08	-.0441	.05	-.0741*	.04
Capital City	.0400	.03	.1616	.06	.1087**	.04	.0601	.04
Meat	.0501	.08	.2975**	.12	.2283	.19	.2020	.19
Diary	.0217	.09	.2140	.15	.1725	.22	.1082	.19
Beverage	.1095	.07	.4650***	.06	.4030**	.17	.3329**	.16
Miscell. food	.0228	.07	.3076***	.11	.2270	.17	.1531	.16
Fat and Oil	-.0151	.07	.3402***	.07	.1957	.17	.1197	.16
Sugar &Confectionary	.0547	.08	.1564	.20	.1446	.20	.1307	.20
Bakery	.1040	.06	.5082	.12	.3961**	.16	.3008*	.16
Grain	.1021	.08	.3693	.06	.3575**	.17	.2781*	.16
Constant	. 0082	.14	-1.867**	.77	.1264	.24	.0929	.22
Country dummies	Yes		Yes		Yes		Yes	
N	398		383		403		398	
F Statistic/Wald	6.44***		77.27***		5.22***		6.48***	
R^2	.31		.18		.19		.29	
Sigma					.32		.30	
AIC	-60.03		487.29		446.55		398.84	
BIC	67.54		609.68		574.51		530.39	
VIF	3.57							

The reported clustered robust standard errors are heteroscedastic consistent.
The p-values are derived from the heteroscedastic consistent standard errors.
*, ** and ***depict significance at 10%, 5% and 1% level respectively.

5.4. Robustness Checks

Firstly, to check the robustness of the results, firm size (log of total employment) is replace with dummies for small, medium and large firms. The results obtained are similar. Also, when country dummies are replaced with 2013 GDP per Capita (at constant 2010 US$ prices) to control for country fixed effects, the results remained largely unaltered. Furthermore, there the concern in the literature of endogeneity of supplier credit in trade credit extension equation. Thus supplier credit may be correlated with the error term in the model. One approach to handling endogeneity problem is to estimate an instrumental variable (IV) model (Greene, 2002). Specifically the instrumental variable Two-Limit Tobit approach is used in this study. The instrument employed is firm legal status, measured as 1 if a firm is a limited liability firm and otherwise. A firm legal status is related to supplier credit. Limited liability companies are largely perceived to have higher reputation, credit quality and lower risk (Omenguele and Mazra, 2013; Isaksson, 2002). They are therefore more likely to receive high level of supplier credit relative to other firms. However, there is no any direct link between legal status and extension of trade credit as a firm's reputation and credit quality is unimportant extending trade credit to other firms. The results of the IV Two-Limit Tobit regression are reported on Table 8. All the marginal effects still carry the signs. However, manager experience and overdraft availability are no longer significant while competition is significant only at the 10% level. As reported under Table 8, the Wald test of endogeneity is found to be statistically insignificant (Prob > chi2 = 0.24), meaning there is no endogeneity once this data is concerned. Thus the error term in the structural equation and reduced form equation are unrelated. As such, the main two-limit Tobit results are upheld.

Table 8: Instrumental Variable (IV) Two-Limit Tobit

Trade Credit Extended	dy/dx	Robust Std. Err.
Supplier Credit	1.3504*	.79
LogFirmAge	-.0508	.05
LogFirmSize	-.0084	.04
LogExperience	.0578	.04
Foreign Ownership	-.0547	.07
Product Diversification	-.2493**	.10
International Diversification	-.0646	.08
Access to credit	.0076	.08
Overdraft Availability1	.0744	.10
Overdraft Availability2	.0450	.05
Financial Constraint	.1004	.06
Competition	.0284*	.02
Low Capacity	-.0483	.08
Medium Capacity	-.0880	.09
High Capacity	-.1131**	.06
Capital City	-.0230	.09
Meat	.1877	.20
Diary	.0541	.19
Beverage	.2545	.20
Misfood	.0596	.20
FatOil	.0232	.20
SugarCo	.1300	.23
Bakery	.1740	.21
Grain	.1550	.22
Country Dummies	Yes	
Constant	-.0530	.29
/alpha	-.9201	.79
/lns	-1.2100***	.07
/lnv	-1.4116***	.04
s	.2982	.0120
v	.2438	.0110
Wald	113.79***	
N	394	

Instrumented: Supplier Credit (UTC)
Wald test of exogeneity (/alpha = 0): Chi2(1) = 1.37 Prob > chi2 = 0.2414

6. Conclusion and Suggestion for Future Research

The incidence of trade credit activity among agro-food manufacturing firms in Africa is relatively high, with 60.5% of firms extending trade credit to customers downstream and 55% of firms receiving trade credit from input suppliers upstream. However, the level of trade credit extended and received are relatively low. The average of level of trade credit in total yearly input purchases is 22% while the average level of trade credit extended as proportion of total yearly sales is 19%. About 30% of firms neither extend nor received trade credit; this number is quite high. This combined with the low level of trade credit extended and received lend credence to

the assertion that cash sales dominate trade in the agro-food industry. In explaining extension of trade credit, manager experience, product diversification, access to bank credit, supplier credit, overdraft availability and capacity utilization are important factors. Based on these results, the commercial motives for extension of trade credit are supported. In particular, financing, marketing, quality guarantee and long-term relationship motives are concluded to drive trade credit extension in the agro-food industry.

The data has limitations that constrained the scope of analysis in this paper. The data is cross-sectional in nature and does not support undertaking dynamic analysis. Also, information on many aspects of trade credit such as trade discounts, discount period, credit period and characteristics of the firms' suppliers and customers are absent in the data. Thus the analysis is restricted to only factors relating to the firms studied. Future research may focus on studying trade credit activity along entire value chains. Also, future research should focus on how extension of trade credit affects firm value since the ultimate goal of engaging in trade credit relationships is value creation.

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Appendix1: Summary of Variables and Measurement

Variable	Measurement
Trade Credit Extended (DTC)	$Accounts\ Receivable_{it}/Total\ Sales_{it}$
Trade Credit Received (UTC)	$Accounts\ Payable_{it}/Total\ Input\ Purchases_{it}$
Firm Age	Natural logarithm of years in operation plus 1
Firm Age^2	Firm age squared
Firm Size	Natural logarithm of total employment plus 1
Foreign Ownership	1 if at least 10% foreign owned and 0 otherwise
Manager Experience	Natural logarithm of years of top manager industry experience plus 1
Product Diversification	$Sales\ from\ main\ product_{it}/total\ sales_{it}$
International Diversification	$Direct + indirect\ export\ Sales_{it}/total\ sales_{it}$
Bank Credit	1 if firm has access to bank credit/credit line and 0 otherwise
Overdraft1	1 if overdraft facility is available and 0 otherwise
Overdraft2	1 if overdraft facility is unavailable and 0 otherwise
Overdraft3	1 if firm does not know if overdraft facility is available and 0 otherwise
Financial Constraint	1 if firm faces no or minor finance obstacle and 0 otherwise
Competition	1-5
IDK Capacity	1 if a firm does not know the capacity in use and 0 otherwise
Low Capacity	1 if a firm's capacity utilization ranges from 1-49% and 0 otherwise
Medium Capacity	if a firm's capacity utilization ranges from 50-79% and 0 otherwise
High Capacity	1 if a firm's capacity utilization ranges from 70-100% and 0 otherwise
Country dummies	Burundi, Malawi, Mauritania, Namibia, Nigeria, Senegal, Sudan, South Sudan
Sub-industry dummies	Meat, dairy, grain, fat and oil, sugar and confectionery, beverage, fruit and vegetables, bakery and miscellaneous foods
Capital city	1 if firm is located in capital city and 0 otherwise